



(43) International Publication Date
26 August 2004 (26.08.2004)

PCT

(10) International Publication Number
WO 2004/073034 A3

(51) International Patent Classification?: C25D 15/00,
9/00, 11/00, 9/02, B32B 9/04

(21) International Application Number:
PCT/US2004/003878

(22) International Filing Date: 11 February 2004 (11.02.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/446,979 12 February 2003 (12.02.2003) US
60/446,978 12 February 2003 (12.02.2003) US
PCT/US03/26356 22 August 2003 (22.08.2003) US
PCT/US03/40801 19 December 2003 (19.12.2003) US

(71) Applicants (for all designated States except US): UNI-
VERSITY OF MARYLAND COLLEGE PARK
[US/US]; Suite 300, 6200 Baltimore Avenue, Riverdale,

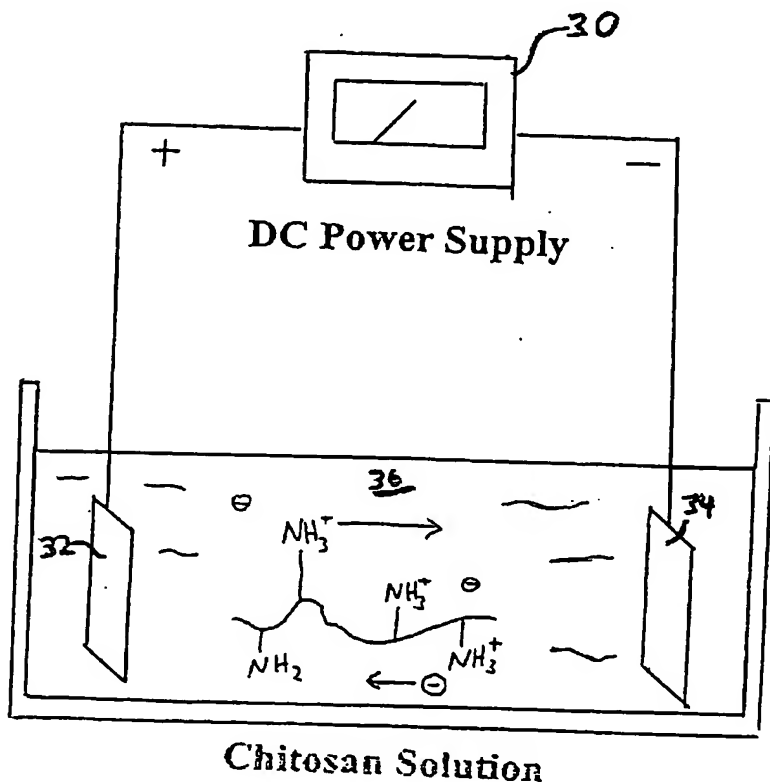
MD 20737 (US). UNIVERSITY OF MARYLAND
BALTIMORE COUNTY [US/US]; 1000 Hilltop Cir-
cle, Baltimore, MD 21250 (US). UNIVERSITY OF
MARYLAND BIOTECHNOLOGY INSTITUTE
COLUMBUS CENTER [US/US]; 701 East Pratt Street,
Suite 200, Baltimore, MD 21202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): PAYNE, Gregory,
F [US/US]; 1803 Miller Road, Cockeysville, MD 21030
(US). RUBLOFF, Gary, W. [US/US]; 13720 Spring-
dale Drive, Clarksville, MD 21029 (US). YI, Hyunmin
[KR/US]; 3907 Lakehouse Road, #13, Beltsville, MD
20705 (US). FERNANDES, Rohan [IN/US]; 11366
Evans Trail, Apt. 104, Beltsville, MD 20705 (US). WU,
Li-Qun [CN/US]; 3427 Tulane Drive #14, Hyattsville, MD
20783 (US). GHODSSI, Reza [IR/US]; 5805 Edson Lane,
#203, Rockville, MD 20852 (US). BENTLEY, William,
E [US/US]; 909 White Marlin Way, Annapolis, MD 21401
(US). CHEN, Tianhong [CN/US]; 3429 Tulane Drive,

[Continued on next page]

(54) Title: CONTROLLED ELECTROCHEMICAL DEPOSITION OF POLYSACCHARIDES, FILMS AND HYDROGEL AND
MATERIALS FORMED THEREFROM



(57) Abstract: A method is provided for electrochemically depositing a polysaccharide mass having a selected physical state. According to an embodiment, an electrically conductive support of a substrate is contacted with an aqueous solution including a selectively insolubilizable polysaccharide, and the selectively insolubilizable polysaccharide is electrochemically deposited on the electrically conductive support while controlling deposition conditions to form the polysaccharide mass having the selected physical state, such as that of a hydrogel. Deposition may be performed in a spatially and/or temporally controlled manner.



Apt. 1, Hyattsville, MD 20783 (US). **SMALL, David, Andrew** [US/US]; 1110 Fidler Lane, Apt. 807, Silver Spring, MD 20910 (US).

(74) **Agent: LINIAK, Thomas, P.**; Liniak, Berenato & White, 6550 Rock Spring Drive, Suite 240, Bethesda, MD 20817 (US).

(81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH,

GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) **Date of publication of the international search report:**

28 October 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/03878

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C25D15/00, 9/00, 11/00, 9/02; B32B 9/04

US CL : 205/109, 316, 317, 318; 428/411.1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 205/109, 316, 317, 318; 428/411.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 2002/0084194 A1 (REDEPENNING) 4 July 2002 (04.07.2002), all of disclosure.	1, 8-13, 24, 25, 27 and 30 2-7, 14-23, 26, 28, 29 and 31-43

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

11 August 2004 (11.08.2004)

Date of mailing of the international search report

20 AUG 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Roy V King

Telephone No. 571-272-1700

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/03878

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/03878

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.b of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:

a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

b. format of material

☐

in written format

☐

in computer readable form

c. time of filing/furnishing

☐

contained in the international application as filed

☐

filed together with the international application in computer readable form

☐

furnished subsequently to this Authority for the purposes of search

2. ☐

In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments: